Accommodations Toolkit

Assistive Technology: Research

This fact sheet on assistive technology is part of the *Accommodations Toolkit* published by the National Center on Educational Outcomes (NCEO). It summarizes information and research findings on assistive technology as an accommodation.[1] This toolkit also contains a summary of states' accessibility policies for assistive technology (/nceo/accommodations-toolkit/assistive-technology-policies).

What is assistive technology? The Individuals with Disabilities Education Act (IDEA) Amendments of 1997 define assistive technology devices as "any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of a child with a disability" (§20 U.S.C. 1401(1)(A)). It should be noted that this definition does not include medical devices that are surgically implanted (Bouck & Long, 2021; Bouck et al., 2012; Kapsiak, 2018; Ohleyer, 2016; Peterson, 2017; Polkowski, 2017; Poudel, 2014; Satsangi et al., 2019). Assistive technology devices can range from high-tech computers or communication devices to low-tech inexpensive adaptations or use of simple tools (Atchison, 2008). Some examples of assistive technology devices are video magnifiers, braille embossers, note-taking devices such as

a smart pens and audio software, touch screens, adapted computing programs, augmentative communication devices, books on tape, switches, alternative keyboards, picture boards, tactile graphics, eye gauze boards, environmental controls, weighted vests, and pencil grips (Atchison, 2008; Bouck & Long, 2021; Hahn et al., 2019; Kapsiak, 2018).

What are the research findings on who should use this accommodation? Research shows that some students who are blind or low vision (Ajuwon et al., 2016; Hahn et al., 2019), have specific learning disabilities (Bouck & Long, 2021; Bouck et al., 2012; Kapsiak, 2018; Ohleyer, 2016; Peterson, 2017), mild disabilities (Bouck et al., 2012), traumatic brain injuries (TBI) (Kapsiak, 2018; Ohleyer, 2016; Peterson, 2017), attention-deficit/hyperactivity disorder (ADHD; Bouck et al., 2012), autism (Kapsiak, 2018; Peterson, 2017), deaf or hard of hearing (Peterson, 2017), emotional and behavioral disorders (Bouck & Long, 2021; Bouck et al., 2012; Peterson, 2017), speech or language impairment (Peterson, 2017), intellectual disabilities (Bouck & Long, 2021), multiple disabilities, orthopedic impairment, or other health impairment (OHI) (Kapsiak, 2018; Peterson, 2017) may benefit from the use of assistive technology. Some English learners with disabilities and students with Section 504 plans may also benefit from assistive technology (Kapsiak, 2018; Polkowski, 2017).

What are the research findings on implementation of assistive technology? Eight studies were located that addressed assistive technology accommodation implementation.

- Three studies examined the use of assistive technology devices used by students who are blind or have low vision. Commonly used devices by students with visual impairments included text-to-speech, computer screen-enlargement software, touch screen with tactile feedback, specialized calculators, braille embossers, and note-taking devices. These studies found that students who have visual impairments became more efficient in completing schoolwork when using assistive technology devices, and that they could access previously inaccessible mathematical spatial and visual information. An issue identified by the research was that some students utilized assistive technology devices that were not compatible with other school technology like online testing platforms. These barriers could stem from the use of assessments that were not designed to support the assistive devices used by the student, lack of funding for compatible devices or software, or inadequate training for teachers on assistive technology selection and implementation (Ajuwon et al., 2016; Hahn et al., 2019; Kelly, 2009).
- Five studies focused on students with high incidence disabilities (e.g., specific learning disabilities, other health impairments including attention difficulties, etc.) who used assistive technology. Three of the studies (Bouck & Long, 2021; Bouck et al., 2012; Poudel, 2014) found that students using assistive technology had higher academic success, a better understanding of content being taught, higher graduation rates, and higher paying jobs after graduation. Ohleyer (2016) looked at students with specific learning disabilities who used assistive technology to support writing in the classroom and on standardized assessments and found that the use a keyboard to write compositions instead of handwriting improved test performance significantly—specifically, in proofreading, vocabulary use, word recognition, and reading comprehension. Kapsiak (2018) examined whether students with reading disabilities who used assistive technology performed better than students who did not use assistive technology. The study found that students using assistive technology were able to focus on the learning task and better access grade level text independently.

What perceptions do students and teachers have about assistive technology? Nine research studies examined student and teacher perceptions about the use of tactile graphics.

- Three studies examined the perceptions of teachers of students with visual impairments regarding their knowledge and skills selecting and implementing assistive technology. In one qualitative study of teachers of students with visual impairments, over half (57.5%) reported that they were not confident in their ability to teach a student how to use assistive technology devices (Ajuwon et al., 2016). According to Hahn et al. (2019), teachers of students with visual impairments were unable to use assistive technology or they were unprepared to make content available via assistive technology. Finally, Kelly (2009) found that teachers said that students with visual impairments whose parents were actively involved in their education were more likely to use assistive technology.
- Three studies found that teachers, both special education and general education, could create barriers to students accessing and using assistive technology because of their lack of knowledge. Teachers struggled making assistive technology available to students because of their own discomfort, lack of experience, and inability to communicate effectively about the use of the technology. Additionally, teachers believed that, at the school or district level, limited funding and lack of support acted as barriers (Atchison, 2008; Ohleyer, 2016; Peterson, 2017).
- Two studies explored the use of assistive technology by students with high-incidence (specific learning disabilities, emotional or behavioral disabilities, attention deficit hyperactivity disorder, mild intellectual disabilities). Bouck et al. (2012) found that many high school teachers perceived that students used assistive technology as a cognitive aid (processing) rather than as an accommodation to provide accessibility. This perception may have led to students being given assistive technology that did not adequately mitigate barriers and enable them to demonstrate what they have learned (Bouck & Long, 2021; Bouck et al., 2012).
- Two studies focused on the perceptions of students with high-incidence disabilities regarding their involvement in the assistive technology decision-making process. Poudel (2014) found four factors that influenced student input and decision making: (1) the device's features, (2) social support, (3) student skills and experiences, and (4) when the assistive technology is introduced to the student. Students reported that the process of selecting devices did not include consideration of assessment and evaluation findings, and that students often had little or no involvement in the final decision (Bouck & Long, 2021).

What have we learned overall? In general, some students with disabilities who are in many different disability categories (e.g., blind or low vision, specific learning disabilities, TBI, autism, deaf or hard of hearing, emotional and behavioral disorders, speech or language impairments, intellectual disabilities, multiple disabilities, orthopedic impairment, OHI), including some English learners with disabilities, may benefit from an array of assistive technology devices. Students benefit from greater access to instruction and assessment when they use assistive technology. Both teachers' and students' perceptions suggested that more training and support may be needed for both general and special education teachers on the selection and implementation of assistive technology. For example, according to Atchison (2008) IEP teams considering assistive technology should consider the student's skills and capacity to use assistive technology, and how they will learn to use it effectively. Students must have the

opportunity to use their assistive technology devices during classroom instruction and assessment so they are prepared to use them on accountability assessments. Additional research is needed on emerging types of assistive technology.

Footnotes

- **[1]**
  Research on assistive technology summarized here is also available in NCEO's searchable *Accommodations for Students with Disabilities Bibliography* (https://nceo.info/Resources/bibliographies/accommodations/bibliography) and in NCEO syntheses of research from 1999 through 2019 (see summaries for: 1999–2001 (https://nceo.umn.edu/docs/OnlinePubs/TechReport34.pdf), 2002–2004 (https://nceo.umn.edu/docs/OnlinePubs/Tech45/Technical45.pdf), 2005–2006 (https://nceo.umn.edu/docs/OnlinePubs/Tech47/TechReport47.pdf), 2007–2008 (https://nceo.umn.edu/docs/OnlinePubs/Tech56/TechnicalReport56.pdf), 2009–2010 (https://nceo.umn.edu/docs/OnlinePubs/Tech65/TechnicalReport65.pdf), 2011–2012 (https://nceo.umn.edu/docs/OnlinePubs/Synthesis94/Synthesis94.pdf), 2013–2014 (https://nceo.umn.edu/docs/OnlinePubs/Report402/NCEOReport402.pdf), 2015–2016 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport412.pdf), 2017 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport418.pdf), 2018 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport423.pdf), 2019 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport433.pdf), 2020 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport436.pdf), 2021 (https://nceo.umn.edu/docs/OnlinePubs/NCEOReport438.pdf)). See the reports and online bibliography for additional information about the criteria used to identify studies included in this fact sheet.

References

Ajuwon, P. M., Meeks, M. K., Griffin-Shirley, N., & Okungu, P. A. (2016). Reflections of teachers of visually impaired students on their assistive technology competencies. *Journal of Visual Impairment &Amp; Blindness*, *110*(2), 128–134. https://doi.org/10.1177/0145482x1611000207 (https://doi.org/10.1177/0145482x1611000207)

Atchison, B. T. (2008). *Assistive technology as an accommodation on accountability assessments: An analysis of attitudes and knowledge of special education professionals* [Doctoral dissertation, Kansas State University]. ProQuest Dissertations and Theses Global.

Bouck, E. C., & Long, H. (2021). Assistive technology for students with disabilities: An updated snapshot. *Journal of Special Education Technology*, *36*(4), 249–257. https://doi.org/10.1177/0162643420914624 (https://doi.org/10.1177/0162643420914624)

Bouck, E. C., Maeda, Y., & Flanagan, S. M. (2012). Assistive technology and students with high-incidence disabilities: Understanding the relationship through the NLTS2. *Remedial and Special Education*, *33*(5), 298–308.

https://doi.org/10.1177/0741932511401037 (https://doi.org/10.1177/0741932511401037)

Hahn, M. E., Mueller, C. M., & Gorlewicz, J. L. (2019). The comprehension of STEM graphics via a multisensory tablet electronic device by students with visual impairments. *Journal of Visual Impairment &Amp; Blindness*, *113*(5), 404–418. https://doi.org/10.1177/0145482x19876463 (https://doi.org/10.1177/0145482x19876463)

Kapsiak, J. A. (2018). *Impact of assistive technology devices for students identified with a disability and an academic need in reading* (Publication No. 13427029) [Doctoral dissertation, State University of New York at Buffalo]. ProQuest Dissertations and Theses Global.

Kelly, S. M. (2009). Use of assistive technology by students with visual impairments: Findings from a national survey. *Journal of Visual Impairment &Amp; Blindness*, *103*(8), 470–480. https://doi.org/10.1177/0145482x0910300805 (https://doi.org/10.1177/0145482x0910300805)

Ohleyer, A. A. (2016). *Elementary tech: Assistive technology, specific learning disability, and state standardized testing* (Publication No. 10076360) [Doctoral dissertation, Capella University]. ProQuest Dissertations and Theses Global.

Peterson, D. H. (2017). *Parental and teacher perspectives on assistive technology* (Publication No. 10600110) [Doctoral dissertation, University of Minnesota]. ProQuest Dissertations and Theses Global.

Polkowski, S. M. (2017). *An analysis of educator practices: Learning and assessment accommodations for students with special needs* (Publication No. 10757827) [Doctoral dissertation, Rutgers, The State University of New Jersey]. ProQuest Dissertations and Theses Global.

Poudel, B. B. (2014). *Acceptance and use of assistive technology: Perspectives of high school and college students with high-incidence disabilities* (Publication No. 3685130) [Doctoral dissertation, University of Delaware]. ProQuest Dissertations and Theses Global.

Satsangi, R., Miller, B., & Savage, M. N. (2019). Helping teachers make informed decisions when selecting assistive technology for secondary students with disabilities. *Preventing School Failure: Alternative Education for Children and Youth*, *63*(2), 97–104. https://doi.org/10.1080/1045988x.2018.1483314 (https://doi.org/10.1080/1045988x.2018.1483314)

Attribution

All rights reserved. Any or all portions of this document may be reproduced and distributed without prior permission, provided the source is cited as:

Fleming, K., Ressa, V., Lazarus, S. S., Rogers, C. M., & Goldstone, L. (2024). *Assistive technology: Research (NCEO Accommodations Toolkit #26a.1)*. National Center on Educational Outcomes.

The Center is supported through a Cooperative Agreement (#H326G210002) with the Research to Practice Division, Office of Special Education Programs, U.S. Department of Education. The Center is affiliated with the Institute on Community Integration at the College of Education and Human Development, University of Minnesota. Consistent with EDGAR §75.62, the contents of this report were developed under the Cooperative Agreement from the U.S. Department of Education, but do not necessarily represent the policy or opinions of the U.S. Department of Education or Offices within it. Readers should not assume endorsement by the federal government.